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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,003	08/10/2006	Tadashi Itoh	1035-646	4549

23117 7590 12/11/2007
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EXAMINER	
LEE, JAE	

ART UNIT	PAPER NUMBER
2823	

MAIL DATE	DELIVERY MODE
12/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/589,003	ITOH ET AL.	
	Examiner	Art Unit	
	Jae Lee	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-12* is/are rejected.

7)☒ Claim(s) *13-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 09/13/2007 have been fully considered but they are not persuasive.

Applicant contends that Yakshin et al. is not producing a film of a single composition. On the contrary, Yakshin et al. does not necessarily exclude the formation of single thin films with single compositions. In fact, Yakshin et al. teaches the formation of multilevel films, but one of ordinary skill in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired. In addition, another teaching, suggestion, or motivation can be seen in the reference. Yakshin et al. teaches that electron beam evaporation allows to selectively control the energy contribution at every stage of film growth (see ¶9, lines 6-7). Applicant must consider the reference as a whole in response to an office action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. **Claims 1,4-8,10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over R. Stanley Williams, David k. Shuh, and Yusaburo Segawa ("Growth and luminescence spectroscopy of a CuCl quantum well structure", American Vacuum Society, Journal of Vacuum Science and Technology A 6(3), May/Jun 1988, pgs 1950-1952, hereinafter Williams et al.) in view of Yakshin et al. (Pub No. US 2005/0150758 A1, hereinafter Yakshin et al.) and further in view of Taniguchi et al. (Pub No. US 2004/0191645 A1, hereinafter Taniguchi et al.).

With regards to **claim 1**, Williams et al. teaches a group I-VII semiconductor crystal thin film formed on a substrate made from ionic crystals,

The group I-VII semiconductor crystal thin film being formed on a buffer layer while a beam is irradiated on the group I-VII semiconductor crystal thin film, the buffer layer being for alleviating distortion caused due to a difference in lattice constant between the substrate and the group I-VII semiconductor crystal film (see Experimental Procedure, ¶1, lines 13-16, buffer layer CaF_2 serves as structural template, Results and Discussion, ¶2, lines 1-3).

Williams et al., however, does not teach the beam to be an electron beam.

In the same field of endeavor, Yakshin et al. teaches how electron beam evaporation allows the user to selectively control the energy contribution at every stage of the film growth (see ¶9, lines 6-7).

Williams et al., however, teaches the semiconductor film to be single crystal (see Fig. 3).

In the same field of endeavor, Taniguchi et al. provides motivation for making the CuCl layer single crystal by teaching how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

In the same field of endeavor, Yakshin et al. teaches how a single crystal thin film being a thin film of single composition and being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5, 6-14; see ¶9, lines 1-7, one of ordinary skill in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create a single film of a single composition while irradiating the electron beam and a layer while not irradiating the electron beam thereon since it has already been made known and demonstrated by Yakshin et al.

With regards to **claim 5**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1**, wherein:

A region formed while irradiating an electron beam thereon and a region formed while not irradiating the electron beam thereon are located different places when viewing the substrate in a direction vertical to its surface (see Yashkin et al., see ¶37, lines 1-5, 6-14, different techniques will deposit on different locations of the surface).

With regards to **claim 6**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1** being a CuCl thin film (see Williams et al., Experimental Procedure, lines 13-16).

With regards to **claim 7**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the group I-VII semiconductor single crystal thin film as set forth in **claim 1** being a metal halide semiconductor thin film (see Williams et al., Experimental Procedure, lines 13-16).

With regards to **claim 8**, Williams et al. teaches a process for producing a group I-VII semiconductor crystal thin film on a substrate made from ionic single crystals, comprising:

forming a buffer layer on the substrate, the buffer layer being for alleviating distortion caused due to a difference in lattice constant between the substrate and the group I-VII semiconductor crystal thin film (see Results and Discussion, ¶2, lines 1-3; buffer layer CaF_2 serves as structural template); and

forming, on the buffer layer, the group I-VII semiconductor crystal thin film, the group I-VII semiconductor thin film being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see Experimental Procedure, ¶1, lines 13-16).

Williams et al., however, does not teach the beam to be an electron beam.

In the same field of endeavor, Yakshin et al. teaches how electron beam evaporation allows the user to selectively control the energy contribution at every stage of the film growth (see ¶9, lines 6-7).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to utilize an electron beam evaporation since it allows the user to selectively control the energy contribution at every stage of the film growth.

Williams et al., however, teaches the semiconductor film to be single crystal (see Fig. 3).

In the same field of endeavor, Taniguchi et al. provides the motivation for using single crystal film by teaching how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

Williams et al. does not teach the single crystal thin film to be of single composition.

In the same field of endeavor, Yakshin et al. teaches how a single crystal thin film being a thin film of single composition and being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5, 6-14; see ¶9, lines 1-7, one of ordinary skill in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create a single film of a single composition while irradiating the electron beam and a layer while not irradiating the electron beam thereon since it has already been made known and demonstrated by Yakshin et al.

With regards to **claim 10**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the process as set forth in **claim 8**, comprising:

forming a layer of the group I-VII semiconductor single crystal thin film while irradiating an electron beam thereon; and

forming the rest of the group I-VII semiconductor single crystal thin film while not irradiating the electron beam thereon (see Yashkin et al., see ¶37, lines 1-5, 6-14).

With regards to **claim 11**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches the process as set forth in **claim 9**, wherein:

the layer formed while irradiating the electron beam thereon and the layer formed while not irradiating the electron beam thereon have film thicknesses that are decided in consideration of a film thickness of the group I-VII semiconductor single crystal thin film, which is the combination of the layer formed while irradiating the electron beam thereon and the layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14, film thickness of entire thin film must be considered to determine the thicknesses of the individual layers).

In the same field of endeavor, Yakshin et al. teaches how a single crystal thin film being a thin film of single composition and being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5, 6-14; see ¶9, lines 1-7, one of ordinary skill in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create a single film of a single composition while irradiating the electron beam and a layer while not irradiating the electron beam thereon since it has already been made known and demonstrated by Yakshin et al.

With regards to **claims 4,12**, the combination of Williams et al., Yakshin et al., and Taniguchi et al. teaches the limitations of **claims 1,8** for the reasons above.

The combination, however, does not teach the group I-VII semiconductor single crystal thin film as set forth having a film thickness that allows an internal electric field to be resonance-increased.

In the same field of endeavor, it would have been obvious to one of ordinary skill to determine the optimum film thickness to allow an electric field to be resonance-increased (see *In re Aller, Lacey, and Hall* (10 USPQ 233-237). It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical (see *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990)).

2. **Claims 2,9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yakshin et al. in view of Taniguchi et al.

With regards to **claim 2**, Yakshin et al. teaches a semiconductor crystal thin film comprising:

A layer formed while irradiating an electron beam thereon; and

A layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14).

Yashkin et al., however, does not teach the semiconductor thin film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

Yakshin et al. does not teach a thin film of single composition.

In the same field of endeavor, Yakshin et al. teaches how a single crystal thin film being a thin film of single composition and being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5, 6-14; see ¶9, lines 1-7, one of ordinary skill in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create a single film of a single composition while irradiating the electron beam and a layer while not irradiating the electron beam thereon since it has already been made known and demonstrated by Yakshin et al.

With regards to **claim 9**, the combination of Williams et al., Yashkin et al., and Taniguchi et al. teaches a process for producing a group I-VII semiconductor single crystal thin film, comprising:

forming a layer of the group I-VII semiconductor single crystal thin film while irradiating an electron beam thereon; and

forming the rest of the group I-VII semiconductor single crystal thin film while not irradiating the electron beam thereon (see ¶37, lines 1-5; layer can also be formed without electron beam such as sputtering and magnetron sputtering, see ¶37, lines 6-14).

Yashkin et al., however, does not teach the semiconductor thin film to be single crystal.

In the same field of endeavor, Taniguchi et al. teaches how a single crystal structure will have better electron mobility than a polycrystalline crystal structure which would make the semiconductor film more effective in operation (see ¶7, lines 1-3).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create single crystal semiconductor films since electron mobility would be greatly enhanced as compared to a polycrystalline structure.

In the same field of endeavor, Yakshin et al. teaches how a single crystal thin film being a thin film of single composition and being a combination of a layer formed while irradiating the electron beam thereon and a layer formed while not irradiating the electron beam thereon (see ¶37, lines 1-5, 6-14; see ¶9, lines 1-7, one of ordinary skill

in the art would have known that a single film can be created with a single composition using electron beam evaporation if so desired).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to create a single film of a single composition while irradiating the electron beam and a layer while not irradiating the electron beam thereon since it has already been made known and demonstrated by Yakshin et al.

Allowable Subject Matter

3. **Claims 13-15** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jae Lee whose telephone number is 571-270-1224. The examiner can normally be reached on Monday - Friday, 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JML

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